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ABSTRACT

The mention of a job title can trigger descriptive and evaluative associations, suggesting that people possess shared job knowledge. This study focused on the concept of implicit job theory and explored the nature of implicit theories to understand the types of information people rely on when they think about jobs and the biases that might exist. Female (N=79) and male (N=21) college students completed the Job Similarity Survey which contained all possible pair comparisons between 15 job titles (accountant, radio/television announcer, bank teller, computer programmer, dental hygienist, dietician, electrician, insurance adjuster, librarian, physical therapist, prison guard, real estate agent, reporter, elementary school teacher, telephone operator). Subjects compared job pairs on a 7-point rating scale of similarities, and also completed the Job Descriptor Survey. The three types of similarity judgments examined were based on incumbent qualifications, tasks required to perform the jobs, and typical pay. The underlying dimensions used to make the global similarity estimates about job titles were recovered using multidimensional scaling. A "male-female" dimension was uniquely identified in the pay condition. People over-relied on sex composition information when making judgments about pay. These findings have implications for the domains of job evaluation and comparable worth. (Author/NB)

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Using Multidimensional Scaling to Explore
Biases in Implicit Job Theories

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Abstract

This research focuses on the concept of implicit job theory and its implications. People do possess shared job knowledge. The impetus for the present study was to explore the nature of these implicit theories to understand the types of information people rely on when they think about jobs and the biases that might exist. The goal was to identify and compare the underlying dimensions people use to make direct comparisons between jobs across different cognitive sets. The three types of similarity judgments examined were based on 1) incumbent qualifications, 2) tasks required to perform the job, and 3) typical pay. The underlying dimensions used to make the global similarity estimates about job titles were recovered using multidimensional scaling. A "male-female" dimension was uniquely identified in the pay condition. People over-relied on sex composition information when making judgments about pay. Implications for job evaluation and comparable worth are discussed.

People possess a myriad of information about jobs. Simply mentioning a job title triggers a host of descriptive and evaluative associations. For example, think about what comes to mind when you read the job title "Accountant?" What about "Physical Therapist?" "Psychologist?"

Smith and Hakel (1979) offer evidence for high levels of convergence among several categories of judges when analyzing jobs using the Position Analysis Questionnaire (PAQ). Interestingly, students provided only with the job titles (naive raters) produced average job profiles very similar to those generated by incumbents, supervisors, and expert job analysts.

As Cornelius, Denisi, and Blencoe (1984) note however, methodological inaccuracies were responsible for inflated estimates of convergent validities. When the convergent validity between naive raters and job experts was recomputed, the value dropped from .92 to .58. What they failed to do was offer evidence against a shared knowledge explanation or consider its ramifications. The present study sought to explore the concept and content of shared job knowledge, which will be called implicit job theory. It is time to begin exploring the types of information people rely on when they think about jobs and the biases that might exist.

Consider Industrial/Organizational Psychologists, who are often faced with the task of having to examine jobs from a number of different perspectives. The particular perspective will dictate which components of the job will be measured. For instance, if you were interested in the area of job design you might look at the jobs in

terms of Hackman and Oldham's (1975) core dimensions. If you were using the PAQ to collect job analysis information, the focus would be on worker-oriented information. Likewise, if you were involved in job evaluation, you would consider jobs with respect to their compensable factors.

In the area of job evaluation and comparable worth, however, there is a lack of consensus regarding the relative emphasis of person versus job as the appropriate basis for determining worth (Mahoney, 1983). Should the focus be on comparable person characteristics (qualifications) or comparable job characteristics (tasks)?

The impetus for the present study was to identify and compare the underlying dimensions people use when making direct comparisons between jobs across several different cognitive sets. Does cueing various cognitive sets yield differences in the underlying dimensions? Are there some underlying dimensions which transcend solutions and others that are uniquely identified? Is there any evidence that discriminatory dimensions are used when rating jobs? The combination of global similarity judgments and multidimensional scaling (MDS) was the most direct means for tapping the underlying dimensions in people's implicit job theories.

Method

Subjects. Seventy-nine female and twenty-one male undergraduates enrolled in an introductory psychology course at The Ohio State University participated in this study and received experimental credit.

Job Title Selection. The 15 job titles selected as stimuli were chosen from the occupations listed in the Bureau of Labor's 1980

Census Report. They are accountant, announcer (radio/TV), bank teller, computer programmer, dental hygienist, dietitian, electrician, insurance adjuster, librarian, physical therapist, prison guard, real estate agent, reporter, elementary school teacher, and telephone operator.

The two criteria used for selecting these job titles were 1) sex composition of the jobs, and 2) ratings of occupational prestige. Based on the statistics available from the census information, job titles were chosen to represent occupations varying along a sex composition continuum. These data (in terms of the percentage of female incumbents) are presented in Table 1. The mean percentage female occupancy for this sample of job titles is 53.

Second, the occupational prestige ratings (Treiman, 1977) of the predominantly male and female jobs were matched as closely as possible. Although rarely a factor examined in our research, prestige has demonstrated to be a very potent variable that can mask differences in other variables, such as average intelligence (Hakel, Hollman, & Ohnesorge, 1971). The correlation between sex composition and occupational prestige for this sample was .02.

Procedure. Subjects completed the Job Similarity Survey which contained all possible pair comparisons between the 15 job titles. The Ross ordering (1934) restriction was imposed on the pairing of the job titles and each judgment was made on a 7-point rating scale. The scales were anchored "very similar" at one end (1) and "very dissimilar" at the other (7).

What was actually manipulated in this investigation was the cognitive set people used when making their similarity judgments among the job titles. Three cognitive sets were examined. In the first

condition, people judged how similar the jobs in each pair were to one another based on the qualifications required of incumbents in the job. This is referred to as the qualification condition. Similarity estimates in a second condition, the task condition, were made in terms of how similar the jobs in each pair were based on the tasks required to perform the jobs. In the final condition, participants were instructed to judge how similar the jobs in each pair were based on the typical pay of the jobs. This is the pay condition.

A manipulation check was conducted to ensure that subjects were basing their similarity estimates using the appropriate cognitive set.

Finally, all subjects completed the Job Descriptor Survey (JDS). Each job was evaluated on a series of unidimensional rating scales to facilitate interpretation of the scaled dimensions.

Results

The data from each of the three experimental conditions were analyzed separately using the nonmetric Alternating Least Squares Scaling (ALSCAL) multidimensional scaling algorithm. The data were assumed to be ordinal and matrix conditional. To assess the dimensionality of the scaling solutions, MDS analyses were run requesting 1, 2, 3, 4, and 5 dimensional solutions for each condition. Using the conventional criteria to assess dimensionality (dimension-by-fit measure (STRESS) plots and interpretability), three-dimensional solutions were selected as the optimal models for the qualification and pay conditions. A two-dimensional solution provided the best fit for the data within the task condition.

The overall squared correlation (RSQ) for the qualification, task, and pay conditions are .60, .58, and .47, respectively. Each

nonmetric MDS model accounted for a substantial proportion of the variability of the optimally scaled data (disparities) within each condition.

Individual Dimension Comparisons. Using the coefficient of congruence (Harmon, 1967; MacCallum & Cornelius, 1977), it was possible to compare the dimensions recovered in one MDS solution with those obtained in the other MDS solutions. It served as an index of the degree of overlap of dimensions across cognitive sets (Table 2).

Though there is no quantitative rule of thumb, values exceeding about .80 were considered to be relatively good matches. As the results indicate, some dimensions were unique to scaling solutions and others transcended solutions.

Identification and Labeling of MDS Dimensions. Several sources of information were pooled to facilitate the identification and labeling process and to minimize the subjectivity involved. Among these sources were the coefficients of congruence, the manipulation check data, correlations with the JDS data, and the sex composition and prestige statistics. Table 3 contains the labels assigned to the recovered dimensions and the amount of variability each accounted for by condition.

The Male-Female Dimension. The dimension of greatest concern to this audience emerged exclusively in the pay condition. When people were asked to make similarity estimates among jobs based on their typical pay, a relatively clean "male-female" dimension was recovered. At one end of the continuum are jobs predominantly occupied by males and at the other extreme are jobs predominantly occupied by females. The stimulus configuration of this dimension is presented in Figure 1.

The correlation between the stimulus coordinates of this dimension and the sex composition data is .81 (highly significant). The sex composition data did not correlate with any dimensions in the other scaling solutions.

As an additional analysis, the stimulus coordinates of the male-female dimension were also correlated with the average pay of these jobs (based on 1980 census data). For this sample of job titles, the correlation is -.71. (It should be noted that the correlation between the sex composition data and the average pay data is also -.71.) Given that sex composition correlated more highly with the scaled dimension than did average pay, people over-relied on sex composition information when making judgments about pay similarity.

A post hoc descriptive analysis was performed to try to identify who weighted this male-female dimension more heavily than others in the model. Interestingly, this dimension was most important for 32% of the females and 83% of the males in this condition.

Conclusions

A male-female dimension was recovered only when people thought about jobs in terms of pay. Sex composition information was over-relied on when making pay similarity estimates among job titles. Apparently, people think about jobs in a unisex manner--except when it comes to pay.

It also appears that men placed greater weight on the male-female dimension than women. This finding is based on a very small sample, however. Future MDS studies should investigate this further and concentrate on identifying other personal characteristics (i.e., traits, attitudes, values) that might be related to the use of

incumbents' sex as a dimension in judging pay. An ultimate goal would be to predict and control this bias.

These results have implications for the domains of job evaluation and comparable worth. In the present study, there was no evidence of bias in the solutions when people compared jobs based on incumbent qualifications or tasks required to perform the job. It is important to note that under experimental conditions, these judgments have no ramifications. In an organizational setting, however, a job evaluation specialist making similar comparisons among jobs would be aware that they are used to establish pay scales. Ideally, we would like to believe that the job evaluation specialist does operate according to a specified cognitive set (e.g., qualifications, tasks) consistently throughout the entire evaluation process. The question remains unanswered as to whether this is true. It would be of particular concern if people vacillated between cognitive sets when making their assessments - especially if one of these cognitive sets was pay. This could introduce the biases that many job evaluation techniques have sought to minimize.

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Table 1

Percentage of Female Incumbents within the 15 Job Titles (based on 1980 census data)

Job Title	% Female Incumbents
Dental Hygienist	97
Bank Teller	91
Telephone Operator	91
Dietitian	88
Librarian	78
Physical Therapist	67
Elementary School Teacher	61
Insurance Adjuster	57
Reporter	42
Accountant	34
Real Estate Agent	34
Computer Programmer	28
Announcer	15
Prison Guard	12
Electrician	2

Table 2

Coefficients of Congruence Across All Pairs of Dimensions

	1								
Qualification	2	.04							
	3	-.03	-.01						
	1	.84	.13	-.51					
Task	2	-.04	.93	.24	-.03				
	1	-.22	-.60	.30	-.35	-.20			
Pay	2	.23	-.31	-.34	.27	-.36	.15		
	3	.37	.38	-.31	.57	.36	.01	.06	
		1	2	3	1	2	1	2	3
		Qualification			Task		Pay		

Table 3

The Labels and Overall Importance of the Scaled Dimensions Across Conditions

Condition	Dimension	Label	RSQ
Qualification	1	Working with People vs. Working with Data/Things	.22
	2	Amount of Specialized Training	.21
	3	Nature of Public Service	.17
Task	1	Working with People vs. Working with Data/Things	.36
	2	Amount of Specialized Training	.22
Pay	1	Prestige	.19
	2	Male-Female	.16
	3	Working with People vs. Working with Data/Things	.12

PAY

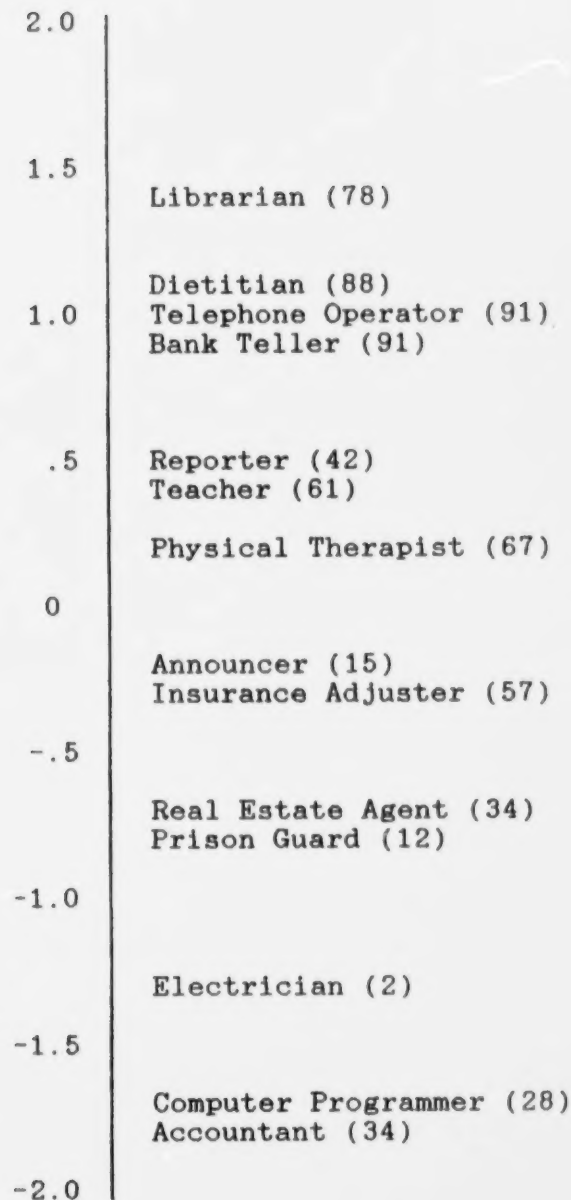


Figure 1. Unidimensional Representation of the "Male-Female" Dimension as Identified in the Pay Condition.
(Note: Values in parentheses are the percentages of female incumbents based on 1980 census data).